

Draft External Assessment Resources
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2



Level 2 Physics

2.3: Demonstrate understanding of waves

Credits: Four

Check that you have completed ALL parts of the box at the top of this page.

Check that you have been supplied with the resource sheet for Level 2 Physics.

You should answer ALL parts of ALL questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–13 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO YOUR TEACHER AT THE END OF THE ALLOTTED TIME.

For Assessor's use only		Achievement Criteria	
Achievement		Achievement with Merit	Achievement with Excellence
Demonstrate understanding of waves.	<input type="checkbox"/>	Demonstrate in-depth understanding of waves.	<input type="checkbox"/>
Overall Level of Performance		<input type="checkbox"/>	<input type="checkbox"/>

You are advised to spend 60 minutes answering the questions in this booklet.

QUESTION ONE: MIRRORS

- (a) The wing mirror on Sandy's car and the mirror a dentist uses are curved mirrors. (The wing mirror is convex and the dentist's mirror is concave.)

Explain in detail why both types of these mirrors produce a virtual image in the following situations:

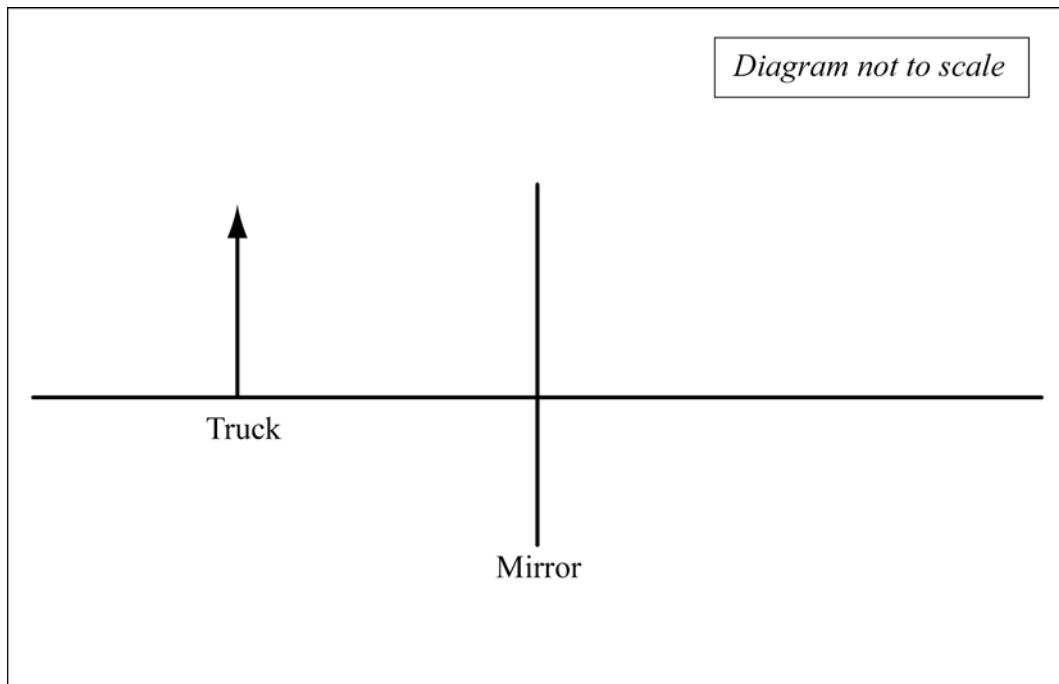
- a virtual image in the wing mirror of a car is always formed no matter where the object is located
- a virtual image in the dentist's mirror is formed only when the mirror is held close to the teeth.

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- (b) While Sandy is driving, she notices the image of a truck in the wing mirror. The truck is 3.5 m away from the mirror. The focal length of the mirror is 75 cm.

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In the box below, draw a diagram to locate the position of the image in the wing mirror. The truck is represented by an arrow pointing upwards. In your diagram, you should indicate the shape of the mirror AND the focal point of the mirror.

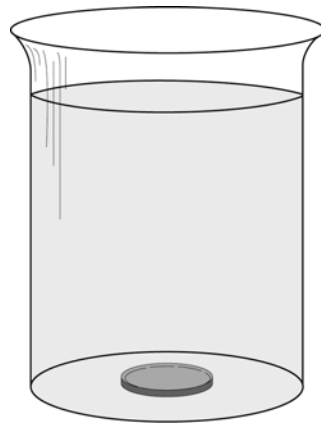


- (c) Later, the truck is 5.4 m away from the mirror. The focal length of the mirror is 75 cm. Calculate the magnification of the image. In your answer, you should include the distance of the image from the mirror.

Magnification: _____

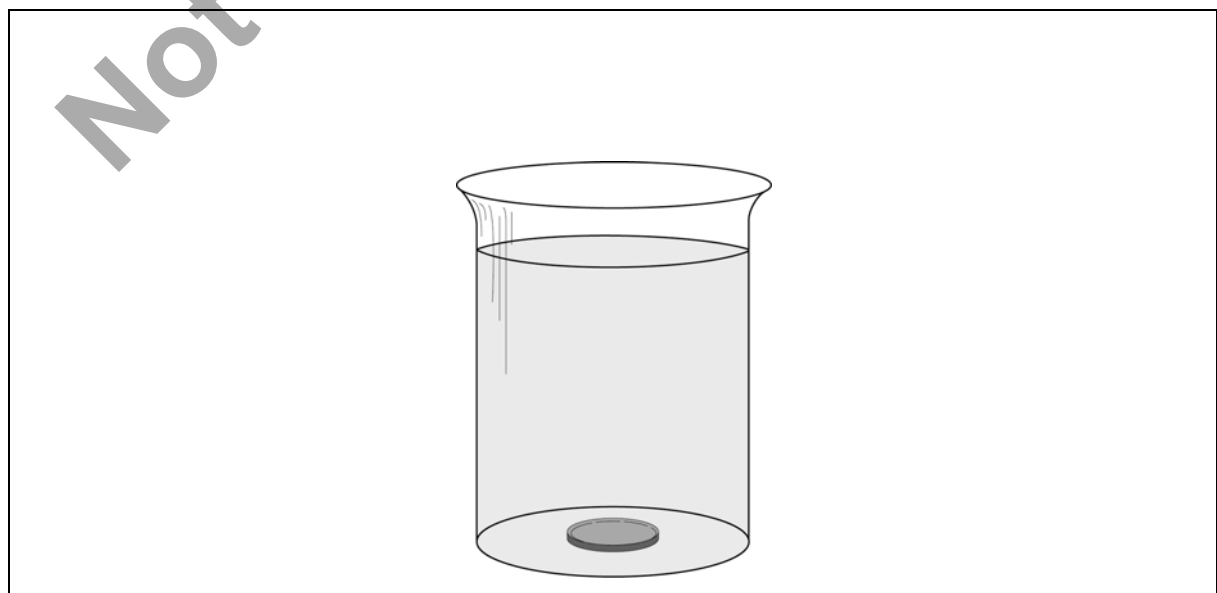
QUESTION TWO: REFRACTIONAssessor's
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Sandy fills a beaker with water and places a fifty cent coin in the beaker as shown in the diagram below. Sandy then looks at the coin in the beaker from above.

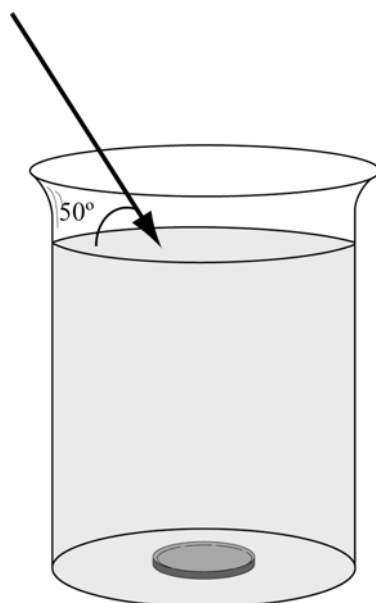


- (a) Explain what Sandy would notice about the coin once she pours water in the beaker to the level indicated in the diagram above.

In your answer, you should give reasons for Sandy's observation of the coin once the water is poured into the beaker. Sketch on the diagram provided below to support your explanation.



- (b) Sandy shines a red laser on to the coin that is now covered with water as shown in the diagram below. The red laser light travels from the air into the water.



The wavelength of red light **in the air** is 7.2×10^{-7} m. The laser makes an angle of 50° with the surface of the water. The refractive index of water is 1.33. Assume the refractive index of air = 1.00.

- (i) Calculate the angle of incidence of the laser light at the surface of the water.

- (ii) Calculate the wavelength of the red laser **in the water**.

Wavelength: _____

- (c) Describe the term **critical angle of water**.

- (d) Calculate the critical angle of water.

Critical angle: _____

- (e) Explain what happens to a ray of light if it is incident at an angle greater than the critical angle. You must draw a diagram in the box below to support your answer.

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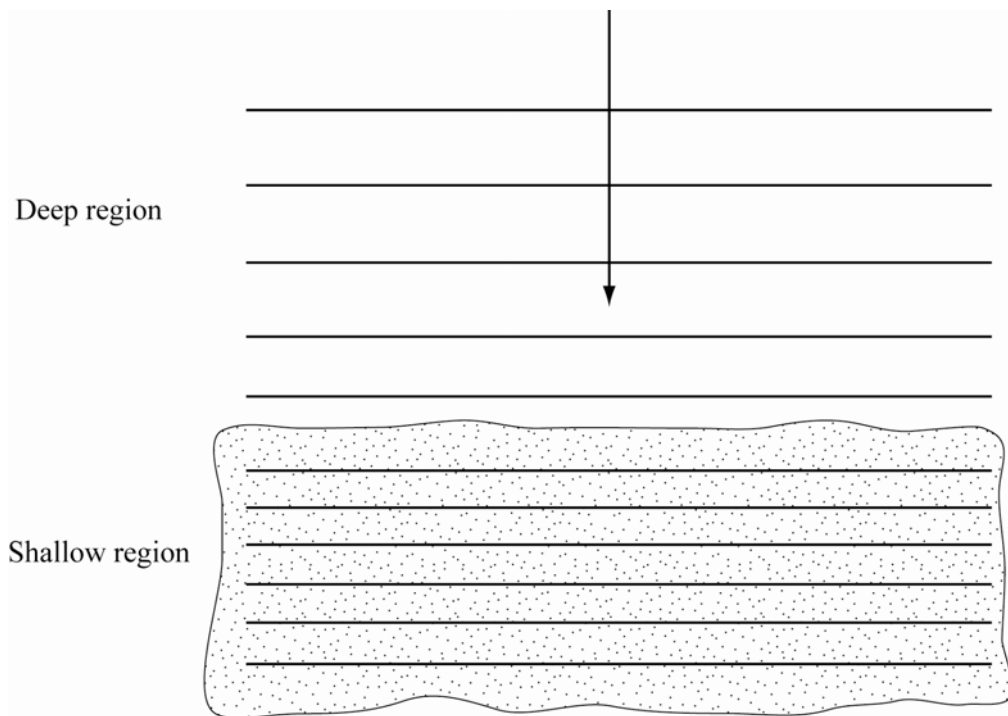
QUESTION THREE: WAVESAssessor's
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Sandy's physics teacher takes the students out to the playing field where he has placed two speakers close together as shown in the diagram below. The two speakers produce the same sound.



- (a) Explain what the students hear as they walk from point A to point B as shown in the diagram above. In your answer, you should include ideas about interference.

- (b) Sandy stands on a cliff watching the waves approaching land. She notices that the wavefronts are closer together as they reach the shallow regions of the beach as shown in the diagram below.

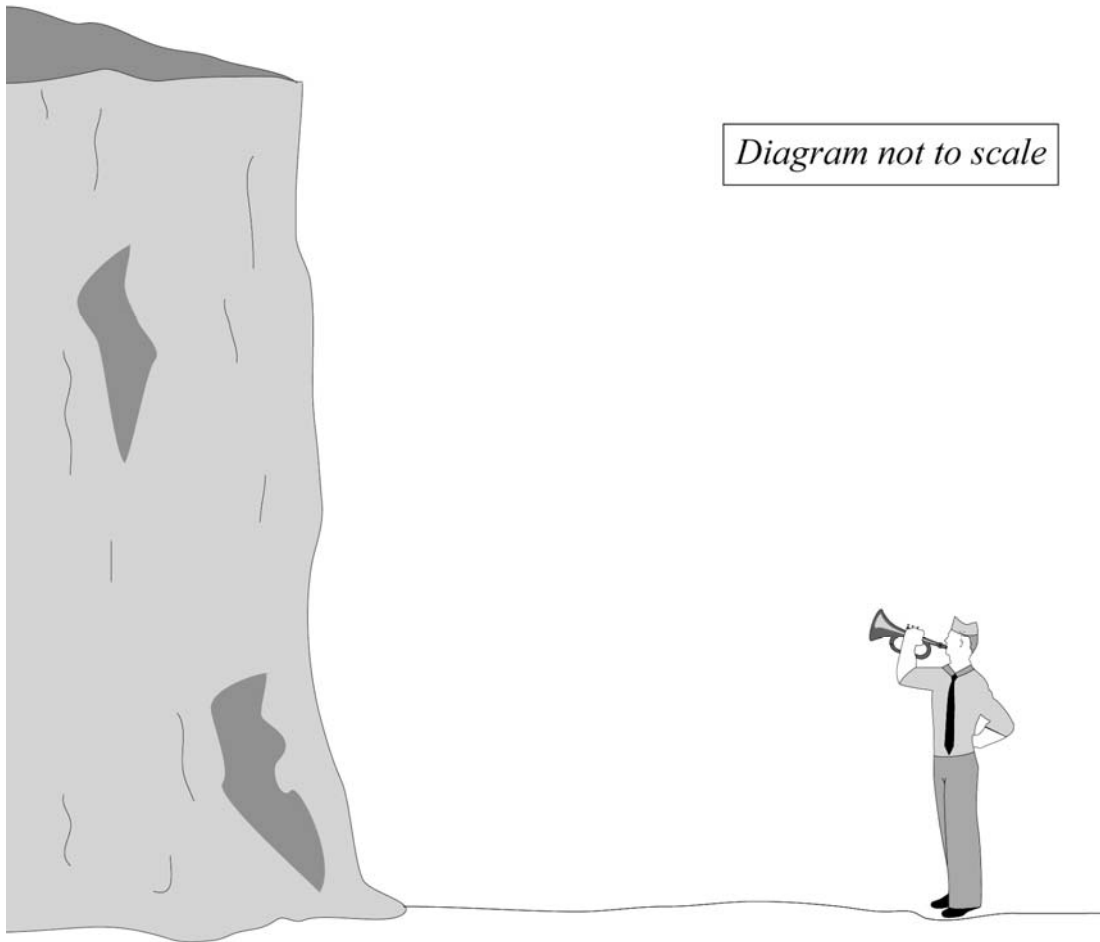


Explain why the wavefronts are closer together as they reach the shallow regions of the beach. In your answer, you should include ideas about:

- wave speed
- wave frequency
- wavelength.

- (c) A man plays a note on a trumpet near a cliff as shown in the diagram below. The echo of the note is heard 8.4 s later. The speed of sound in air is 330 ms^{-1} .

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- (i) Calculate the distance between the trumpet player and the cliff.

Distance: _____

- (ii) Explain whether the pitch of the echo will be different.

- (iii) A dense fog descends between the trumpet player and cliff.

Explain what effect the fog would have on the echo. In your answer, you should cover the relationship between the fog and its effect on the:

- time taken for the echo to be heard
- pitch of the sound.

The speed of sound in the water is approximately 1500 m s^{-1} .

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Extra paper for continuing your answers, if required.
Clearly number the question.

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